The test to determine strain-to-failure is to pull a sample until it breaks, and measure the elongation at failure. This is straight-forward materials science. The strain-to-failure is an inherent characteristic of all materials. Applicant does not "produce" a particular strain-to-failure in a material; Applicant merely selects a material that has the desired strain-to-failure characteristics. All solid materials have a strain-to-failure characteristic associated with them. Applicant disclosed several examples of such materials in a rim liner structure as disclosed. The intent is simply to select a material that is able to stretch enough to expand with the rim, without breaking.

Claim 7, rejected under 35 USC 102 as anticipated by Kundermann, has been amended to insert the subject matter of allowable claim 3 (after resolution of the §112 issue), specifically claiming the relationship between the characteristics of the rim liner and the rim that allow growth of the rim liner radially into the rim to maintain compressive contact with the rim throughout operation of the flywheel. Those limitations have now been explained in the attached affidavit, so claim 7 and its dependent claim 8 should now be allowable.

Applicants believe that the claims now pending in this application are patentable for the reasons set forth above and solicits the Examiner's reconsideration of these claims in light of these reasons. If the Examiner decides to adhere to his rejection, he is respectfully requested to enter this amendment to present the application in better form for consideration by the Board of Appeals. If the Examiner, in his independent judgement, concurs with Applicant's opinion that these claims are patentable, he is respectfully requested to pass this application to issue.

Respectfully submitted,

542 SW 298th Street
Federal Way, Washington 98023
voice: (253) 941-7683; fax: (253) 941-3623

J. Michael Neary
Attorney for Applicant
Reg. No. 25,453

Appendix Showing Changes to the Claims

7. (Twice Amended) A hub for a [high speed] flywheel system, comprising:

a flywheel hub having radial splines;

a flywheel rim and a flywheel rim liner inside said flywheel rim, said flywheel rim liner having radial projections mating with said splines to form a torque transmitting coupling between said hub and said liner that maintains concentricity between said hub and said rim liner;

said flywheel rim liner made of a material having a strain-to-failure capability and a ratio R_l equal to E_l/ρ_l, wherein E_l is a hoop modulus of elasticity of said rim liner and ρ_l is the density of said rim liner material;

[said rim liner strain-to-failure capability and ratio R_l being such that said rim liner remains in compressive contact with said rim from start to maximum speed of said flywheel system] said flywheel rim has a modulus of elasticity e_r in said hoop direction and a density ρ_r; and a rim ratio R_r equal to E_r/ρ_r

wherein R_l is less than or equal to R_r, so said flywheel rim liner grows radially with said rim.

10. (Twice Amended) A process of coupling a flywheel rim to a flywheel hub, comprising:

mounting said rim on a rim liner; and

coupling said rim liner to said hub with a torque coupling that allows said liner to grow radially with respect to said hub while remaining concentric thereto during [high speed] operation.

13. (Amended) A process as defined in claim 10, wherein:

said rim includes an inner annulus of E-glass/epoxy and an outer annulus of carbon fiber/epoxy having less material than said E-glass annulus;

whereby said carbon fiber/epoxy annulus is large enough to provide sufficient hoop strength to contain radial forces created in said rim by [high speed] rotation while allowing significant radial growth of said rim away from said hub, and said rim liner

of the rim, and E_l and ρ_l of the rim liner is provided in the attached Exhibit A, and the sources of publicly available information for the material properties of the typical flywheel materials are attached to the Exhibit A as Attachments 1-4.

7. In my opinion, all the information needed to practice the invention is taught by the specification of this application, and the properties of the materials to be used in the flywheel rims and rim liners are readily available from material suppliers and other publicly accessible sources, as exemplified in the Exhibit A and its Attachments.

8. In summary, I believe that the invention of this patent application solves a problem that the best minds in the field were unable to solve and teaches how to make and use the invention in clear and simple terms that are entirely sufficient to enable one of ordinary skill in the art to make and use the invention.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent that issues thereon.

Dennis Simmons

Dennis Simmons □

10/7/2002

Date□

maintains torque coupling and concentricity of said rim and said hub during said operation despite said radial growth.

15. (Amended) A flywheel system, comprising:

a hub;

a flywheel rim concentric on said hub having a carbon fiber/epoxy outer annulus and, contiguous therewith, an E-glass inner annulus with an inner circumferential surface;

a rim liner engaged with said inner circumferential surface of said inner annulus;

said rim liner being made of a material that grows radially with said rim and has sufficient strength to transmit torque between said rim and said hub during flywheel spin-up and during energy recovery from said flywheel; and

a torque coupling between said hub and said rim liner that allows said liner to grow radially with respect to said hub while remaining concentric thereto during [high speed] operation.

18. (Amended) A flywheel system as defined in claim 17, wherein:

said spline teeth of said liner have a Poisson's Ratio which causes said teeth to be compressed under their own centrifugal loading as said rotor is spun to [high] operating speed, causing said teeth to become wider, thereby tightening the connection between the liner teeth and hub, to help keep the rotor stable.